

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
29 June 2006 (29.06.2006)

PCT

(10) International Publication Number  
**WO 2006/068265 A1**

(51) International Patent Classification:

H01L 27/088 (2006.01) H01L 29/788 (2006.01)  
H01L 27/115 (2006.01)

(21) International Application Number:

PCT/JP2005/023699

(22) International Filing Date:

19 December 2005 (19.12.2005)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2004-372775 24 December 2004 (24.12.2004) JP  
2005-097472 30 March 2005 (30.03.2005) JP

(71) Applicant (for all designated States except US): **RICOH COMPANY, LTD.** [JP/JP]; 3-6, Nakamagome 1-chome, Ohta-ku, Tokyo, 1438555 (JP).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **YOSHIDA, Masaaki** [JP/JP]; 1M-1505, Mukogaoka 5-chome, Sanda-shi, Hyogo, 6691544 (JP).

(74) Agent: **ITOH, Tadahiko**; 32nd Floor, Yebisu Garden Place Tower, 20-3, Ebisu 4-chome, Shibuya-ku, Tokyo 1506032 (JP).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

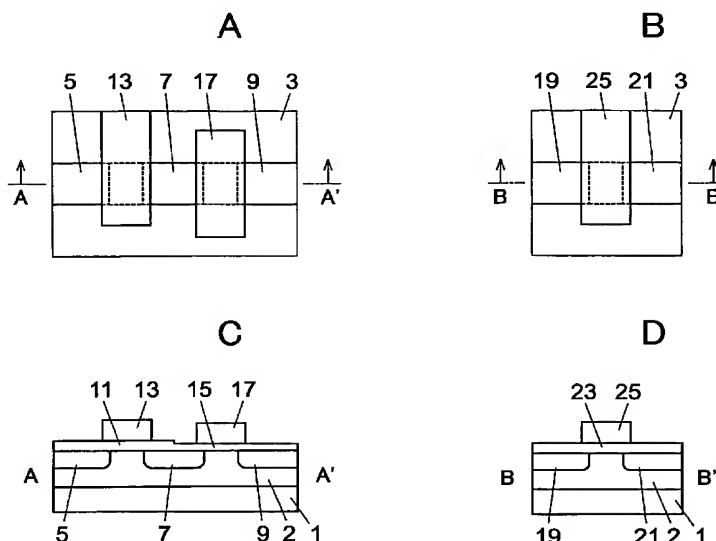
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

[Continued on next page]

(54) Title: SEMICONDUCTOR DEVICE



(57) Abstract: A semiconductor device is disclosed that includes a nonvolatile memory cell having a memory transistor and a selection transistor, and a peripheral circuit transistor. The memory transistor includes a memory gate oxide film that is arranged on a semiconductor substrate, and a floating gate made of polysilicon that is arranged on the memory gate oxide film. The selection transistor is serially connected to the memory transistor and includes a selection gate oxide film that is arranged on the semiconductor substrate, and a selection gate made of polysilicon that is arranged on the selection gate oxide film. The peripheral circuit transistor includes a peripheral circuit gate oxide film that is arranged on the semiconductor substrate, and a peripheral circuit gate made of polysilicon that is arranged on the peripheral circuit gate oxide film. The memory gate oxide film is arranged to be thinner than the peripheral circuit gate oxide film.



WO 2006/068265 A1



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*